NNG12HP08C

SUPPORT FOR ATMOSPHERIC SCIENCES

STATEMENT OF WORK

ATTACHMENT A
REVISED 04/11/2012

11/13/2015

Support for Atmospheric Sciences

I. Scope of the Contract

The NASA Goddard Space Flight Center (GSFC) conducts a comprehensive research and technology development program directed towards observing, monitoring, characterizing, modeling, understanding, and advancing knowledge of the Earth's atmosphere. The research program is aimed at understanding the structure, dynamics, and radiative properties of clouds, aerosols, and precipitation; understanding atmospheric chemistry, especially the role of natural and anthropogenic trace species on the ozone balance in the stratosphere and troposphere; improving short and medium term numerical weather prediction; understanding the influence of solar variability on the Earth's climate; and advancing our understanding of the physical properties of the Earth's atmosphere including its interaction with the Earth surface. Scientists identify requirements for atmospheric observations via satellite missions and sub-orbital instrumentation. Scientists conceive, design, develop, and implement optical, microwave, radar, and lidar technologies for remote sensing of the atmosphere. Scientists further conduct field measurements for satellite sensor calibration and data validation, and carry out modeling activities for atmospheric radiative transfer, climate, clouds, aerosols, chemistry and transport of trace species, and in general the development of next-generation Earth system models. This program of research provides support for GSFC to observe, monitor, explain, and predict trends in the spatial and temporal variability of the Earth's atmosphere. The research also addresses the possible consequences of these trends with respect to climate change, human health, food production, water management, and other issues of societal importance. The research is carried out in collaboration across GSFC organizations and with domestic and international partners in universities, private industry, and other government agencies. All of this work supports and is consistent with the NASA mission in Earth Science. This contract shall support the full scope of this GSFC research and technology development program for studying the Earth's atmosphere. The contract shall also support computing and software engineering efforts for NASA-funded researchers using high end computing resources. The organization of the GSFC and results of recent work are summarized in documents posted on the GSFC's web site, http://atmospheres.gsfc.nasa.gov, with annual reports that provide technical details.

Section 508 Electronic and Information Technology (EIT) Accessibility Standards

In order to comply with the Section 508 Electronic and Information Technology Accessibility Standards, the contractor shall perform all work required under this contract in compliance with the following technical standards delineated in Code of Federal Regulations (CFR) Title 36:

1194.21 Software Applications and Operating Systems
1194.22 Web-based Intranet and Internet Information and Applications

This Statement of Work is divided into six technical areas to specify the functional requirements of the contract:

1. **Instrumentation:** Requirements for supporting the design, development, testing, maintenance, calibration, and operation of sub-orbital instruments for atmospheric

and solar observations. The instruments include sensors operated at GSFC, from the ground, and aboard aircraft, balloons, or other sub-orbital platforms**.**

2. **Data Processing and Analysis:** Requirements for supporting the processing and analysis of data collected by instruments observing the Earth atmosphere or solar radiation from spacecraft, sub-orbital platforms, or the ground.
3. **Earth System Modeling and Analysis:** Requirements for supporting the development, testing, operation, improvement, software optimization, and documentation of computer models that describe Earth system processes including: solar spectral and total radiation, atmospheric radiative transfer, climate simulations, modeling the chemistry and transport of trace species on regional-to-global scales, cloud-resolving models, coupled land-atmosphere models, data assimilation, and development of next-generation Earth system models, including the coupling and integration of existing models to form novel, interdisciplinary models.
4. **Documentation and Presentation:** Requirements supporting the preparation of research proposals, refereed journal publications, manuscripts for symposia proceedings, and presentations at conferences, symposia, workshops, and seminars.
5. **Education and Public Outreach**: Requirements for supporting the communications of research objectives and results to the general public, to NASA management, to authorizing and appropriating committees, and for informal and formal education at all levels.
6. **Mission Science:** Requirements for supporting project scientists in the formulation, implementation, and operation of satellite missions.
7. **System Administration:** Provide all necessary system administration, maintenance, and IT security services belonging to the Laboratory and associated scientists.
8. **Administrative Support:** Provide administrative support to the Laboratory for Atmospheric sciences scientific staff.

Note that while the six technical areas are broken out for the purpose of a clear Statement of Work, in practice, the atmospheric research at GSFC is collaborative and interdisciplinary. Task orders will typically overlap into multiple areas.

II. Functional Requirements

1.0 Instrumentation:

The contractor shall support the specification, design, development, maintenance, calibration, and operation of sub-orbital instruments for atmospheric and solar observations. The instruments include and are not limited to active and passive optical and microwave sensors. The contractor shall operate instruments at GSFC, on top of buildings and in mobile trailers both, at GSFC and in the field, and aboard sub-orbital platforms such as aircraft, balloons, and sounding rockets. The contractor shall support the processing of instrument data for the measurement of total and spectral solar radiance and irradiance and of atmospheric properties such as optical thickness, temperature profiles, clouds, aerosols, ozone, water vapor, boundary layer heights, and wind velocity. Supported instruments and technical equipment will include and not be limited to: the Cloud Physics Lidar (CPL), the Airborne Compact Atmospheric Mapper (ACAM), the High Altitude Wind and Rain Airborne Profiler (HIWRAP), the

Unmanned Aerial Vehicle Radar (URAD), the lidars of the Micro-Pulse Lidar Network (MPLNET), lidar instruments within the Network for the Detection of Atmospheric Chemical Change (NDACC), ground based spectrometers, radio frequency reception systems for receiving data transmitted by orbiting satellites, and other similar instrumentation.

The detailed functions in support of instrumentation that are currently performed at GSFC in support of atmospheric research and development are:

1.1 Provide support to specify technologies and performance, and technical requirements for instrument design;
1.2 Provide engineering support for instrument design and development including system, mechanical, electrical, and optical engineering;
1.3 Provide mechanical and electrical system designs and drawings;
1.4 Perform structural, thermal, and optical performance analyses of instrument designs;
1.5 Design, draw, and fabricate mechanical parts for instruments;
1.6 Design, draw, and fabricate electrical boards for instruments;
1.7 Specify, design, draw and build electrical and mechanical interfaces to platforms such as mobile trailers, towers, aircraft, and balloon pallets
1.8 Test and characterize instrument performance at GSFC and in the field;
1.9 Operate, maintain and repair instruments;
1.10 Calibrate instrument response;
    1.10.1 Maintain and operate ground support equipment and calibration standards traceable to the National Institute of Standards and Technology such as irradiance lamps, integrating spheres, solar diffuser panels, and black bodies;
    1.10.2 Maintain a Class 10,000 clean room that meets ISO 9000 standards;
1.11 Support field experiments and campaigns in accordance with NASA and GSFC safety practices and regulations;
    1.11.1 Provide support to plan and schedule instrument deployments and operations in the field;
    1.11.2 Ship instruments and support equipment to and from field sites in accordance with NASA property management regulations;
    1.11.3 Install support equipment and instruments in mobile trailers, on towers, on ships and buoys, in aircraft and on balloon pallets;
    1.11.4 Operate instruments and collect data in the field, on towers, in trailers, aboard ships, and aboard aircraft;
    1.11.5 Prepare, maintain, and operate the computers and other information technology equipment necessary for operations, instrument data collection, and data processing in the field in accordance with NASA information technology (IT) security practices and requirements;
    1.11.6 Provide computer programs and the associated software upgrades and, documentation, for determining optimal aircraft flight paths for aircraft field campaigns associated with the research efforts supported by this contract;
    1.11.7 Provide investigator coordination, mission document preparation, database design and maintenance, and meeting support for investigators associated

with field campaigns and satellite missions related to research efforts supported by this contract;

1.12 Support instrument data processing;
Develop and document algorithms for processing instrument data and for retrieving solar and atmospheric properties from instrument data;
1.12.1 Implement algorithms in computer software and document the code;
1.12.2 Process instrument data to create data products;
1.12.3 Distribute and provide data and data products to principal investigators, co-investigators, and collaborators;

1.13 Manage instrument laboratories in accordance with NASA safety practices and requirements;
1.13.1 Provide GSFC safety officers;
1.13.2 Ensure that all hazardous materials are stored and used properly;
1.13.3 Ensure that all GSFC equipment is located, maintained, and operated in accordance with NASA safety requirements;
1.13.4 Obtain, document, and remain current on required GSFC equipment certifications.

2.0 Data Processing and Analysis

The contractor shall support the processing and analysis of data used to study the Earth's atmosphere. The data will come from a wide variety of instruments and sensors including and not limited to infrared and microwave atmospheric sounders, microwave radiometers, imaging multispectral ultraviolet, visible, and infrared radiometers and imaging spectrometers, radars and synthetic aperture radars, and lidars. The data may be collected from the ground, sub-orbital platforms, and satellite platforms. The data processing and analysis will support research in areas such as: sensor calibration and measurement validations; aerosol-cloud-climate interactions; atmospheric aerosol content, composition, and circulation; the atmospheric hydrologic cycle; climate variability and climate change; clouds and precipitation; global and regional trends of temperature, ozone, and trace gases; radiative transfer; Ultraviolet-B measurements; and solar radiation. The contractor shall perform the following functions in support of data processing and analysis for such research:

2.1 Define and document algorithms, procedures, and methodologies for reading, ingesting, reformatting, managing, processing, calibrating, and analyzing data;

2.2 Write, test, compile, maintain, update and document software code and programs that implement algorithms for reading, ingesting, reformatting, managing, processing, calibrating, and analyzing data;

2.3 Operate computers and run software for reading, ingesting, reformatting, managing, processing, calibrating, and analyzing data;

2.4 Locate and retrieve data from Earth Observing System (EOS) Distributed Active Archive Centers (DAAC's), from National Oceanic and Atmospheric Administration (NOAA) data centers and archives, from the Department of Energy's Atmospheric Radiation Measurement (ARM) Climate Research Facility, from the National Science Foundation's (NSF) National Center for Atmospheric Research (NCAR), from international providers of atmospheric data (e.g.,

European Space Agency, Japan Aerospace Exploration Agency), and other sources of atmospheric data and observations;

2.5 Establish data bases for the effective organization, management, protection, and retrieval of data;

2.6 Develop, maintain, and populate Section 508 compliant websites, web servers, and ftp sites for the efficient exchange of data, data products, and non-proprietary software between GSFC scientists and their collaborators or for the open dissemination of data and data products to the science community;

2.7 Protect and preclude the dissemination of all proprietary data, data products, and software and all other sensitive material associated with supported atmospheric research in accordance with NASA and GSFC requirements and regulations;

2.8 Process data to convert raw instrument and sensor digital signals to physical units (e.g. to convert digital counts from a radiometer to at-sensor spectral radiance)

2.9 Process data to derive or retrieve geophysical atmospheric parameters, variables, and characteristics (e.g. retrieve atmospheric temperature profiles from sounder data);

2.10 Process data to geolocate observations and to register data and retrieved geophysical variables to latitude and longitude, cartographic projections, and other geospatial reference systems;

2.11 Perform statistical analyses and tests;

2.12 Compare data from multiple sources and at multiple scales to calibrate sensors and instruments, cross-calibrate sensors and instruments, validate parameter retrievals and data products, and validate or assess model results and predictions;

2.13 Document the results of data processing and analyses in reports, presentation charts, graphs, images, maps, animations, and other effective forms of data visualization;

2.14 Perform all computer data processing, analyses, and transfers in accordance with NASA and GSFC information technology (IT) rules, regulations, and safe practices;

2.15 Recommend and apply appropriate software standards and quality assurance plans for all technical software.

2.16 Provide support to develop algorithms and support data processing and analysis for atmospheric research areas including and not limited to:

2.16.1 Measuring, mapping, and tracking cloud and aerosol properties such as cloud optical thickness and effective radii, atmospheric optical thickness, water vapor, and non-precipitating cloud liquid/ice water using instruments aboard satellites (e.g., MODIS, MISR, SeaWiFS, NPP VIIRS), airborne sensors (e.g. the Cloud Physics Lidar), and ground-based sensors (e.g., Micro Pulse Lidar Network);

2.16.2 Measuring the global distribution of rainfall using data from the passive microwave radiometers and active radars aboard the Tropical Rainfall Measurement Mission (TRMM) and the Global Precipitation Mission (GPM) now in development;

2.16.3 Measuring, mapping, and monitoring the ozone hole, total column and tropospheric column ozone, and other trace gas concentrations (e.g., sulfur dioxide, nitrogen dioxide using data from sensors such as the

Ozone Monitoring Instrument (OMI), the Ozone Mapping and Profiler Suite (OMPS), and the Total Ozone and Mapping Spectrometer (TOMS).

2.16.4 Measuring atmospheric temperature and moisture profiles using data from the Atmospheric Infrared Sounder, the Advanced Microwave Sounding Unit and other atmospheric sounders;

2.16.5 Measuring the incoming spectral and total solar irradiance using data from sensors such as the Total Irradiance Monitor (TIM) and the Spectral irradiance monitor aboard the SORCE spacecraft and future missions;

2.17 Produce, archive, manage, and make available atmospheric data sets including and not limited to: global monthly precipitation data sets from the Global Precipitation Climatology Project (GCPC); merged TOMS/SBUV total ozone data set; MPLNET data sets of column and vertically resolved aerosol and cloud data; TOVS Pathfinder and AIRS fields of surface skin and atmospheric temperatures, atmospheric water vapor, cloud amount and cloud height; OMI tropospheric ozone, sulfur dioxide, and nitrogen dioxide data sets; SORCE total and spectral solar irradiance data sets; and Earth surface and reflectivity data sets.

2.18 Analyze and inter-compare global and regional trends of atmospheric and Earth surface parameters using multi-year data from different sensors.

3.0 Earth System Modeling and Analysis

The contractor shall support the development, application, and advancement of numerical models simulating the chemistry and physics of the Earth's atmosphere. Modeling is an essential component of the research into atmospheric processes. Models help GSFC understand how the atmosphere behaves over space and time and how it interacts and is impacted by other Earth system processes including ocean circulation and human-driven emissions and land use. The contractor shall perform the following functions in support of modeling:

3.1. Provide support to define, develop, implement, validate, and document models describing the chemistry and physics of atmospheric and related Earth system processes;

3.2. Provide support to define, develop, implements, validate, and document models that synthesize atmospheric data and observations as a function of sensor design and atmospheric and surface conditions for studies such as observing system simulation experiments (OSSE's);

3.3. Provide support to define, develop, implement, validate, and document methodologies for assimilating data into models;

3.4. Write, test, compile, maintain, update and document software code and programs that implement models and modules, update models and modules, couple models, and assimilate data into models;

3.5. Run and apply models for the simulation and prediction of atmospheric physical and chemical processes under different global change scenarios;

3.6. Run and apply atmospheric process models in support of studies exploring the impact of atmospheric change on climate, related Earth system processes, and

society;

3.7. Run and apply models to synthesize atmospheric data and observations to develop, propose, and assess satellite system and senor designs and operations;

3.8. Compare data and observations from satellite sensors and field campaigns to model simulations and predictions for model validation and understand and interpret atmospheric data, observations, and conditions;

3.9. Manage, organize, and provide support to analyze the data and output generated by model simulations;

3.10. Implement and run models on high end computing centers including but not limited to NASA GSFC NCCS, NASA ARC NAS, and Department of Energy Oak Ridge National Laboratory (DOE ORNL) computing facilities;

3.10.1 Develop and run visualizations of model simulations using the NCCS hyperwall;

3.10.2 Provide expert software engineering support including performance analysis, profiling, optimizing, porting, reengineering, parallelizing, and algorithmic development for models run on high end computing facilities.

3.11. Support the development, coupling, porting, optimization, interoperability, and use of models for research into topics including and not limited to:

3.11.1 Using the Goddard Chemistry Aerosol Radiation and Transport (GOCART) model within the Goddard Earth Observing System (GEOS) general circulation model and the Weather Research Forecast-Chemistry (WRF-Chem) model to study aerosol emissions, plume heights, and transport; aerosol effects on surface radiation; aerosol vertical distributions; seasonal and inter-annual variations of dust sources; and light absorption by pollutants, biomass burning emissions, and dust aerosols;

3.11.2 Coupling the Combined Stratosphere-Troposphere Model (COMBO) to the GEOS general circulation model to study the interaction of the stratospheric ozone layer and climate;

3.11.3 Coupling models to investigate the dynamic and thermodynamic processes associated with cyclones, hurricanes, winter storms, cold rain bands, and tropical and mid-latitude deep convective systems; surface (land and ocean) effects on atmospheric convection, cloud chemistry, cloud-aerosol interactions, and stratospheric-atmospheric interactions; and cloud-climate feedback mechanisms;

3.11.4 Developing and maintaining a modular three-dimensional chemical transport model (CTM) to assess the impact of natural and anthropogenic perturbations on atmospheric composition and chemistry;

3.11.5 Implementing schemes to more realistically predict the size distribution of cloud particles (liquid and ice), aerosol optical properties, and thermal infrared radiative transfer within the GEOS general circulation model;

3.11.6 Simulating the photochemical mechanisms controlling the formation and behavior of ozone and other trace gases in the stratosphere and troposphere and the linkages to air quality and climate;

3.11.7 Applying the National Center for Atmospheric Research (NCAR) Whole Atmosphere Community Climate Model (WACCM) to study the

influence of solar protons on ozone in the stratosphere and mesosphere; and

3.11.8 Simulating radiative transfer through the atmosphere to understand atmospheric effects on the energy balance, convection, circulation, and satellite observations;

3.11.9 Predicting brightness temperatures and reflectivities, as observed by multifrequency microwave radiometers and radars, as a function of precipitation rate and relating cloud thickness, humidity, and other atmospheric conditions to precipitation rates;

3.11.10 Assessing the potential improvement on short and mid range weather forecast skill by assimilation of satellite-based observations.

3.12. Evaluate, design, develop, and implement tools to assist scientists in designing, developing, and executing research models and visualizing and analyzing the model outputs.

4.0 Documentation and Presentations

4.1 Document, catalog, and maintain libraries of the following items associated with this contract: descriptions of software developed, enhanced, or implemented; descriptions of hardware developed, modified, or operated, as well as operating manuals; manuals that describe safety procedures to be followed in the laboratories when operating equipment, when using and storing hazardous materials, and when responding to emergencies in the laboratories.

4.2 Document software necessary to manage GSFC data sets, such as the following: data sets generated by the various observations campaigns and GSFC experiments; results from the research models used in the Branches; archived data sets used in support of the research; and communications software to move data sets between computers.

4.3 Document software necessary to create or process GSFC data sets, such as the following: data sets generated by the various observations campaigns and GSFC experiments; results from the research models used in the Branches; archived data sets used in support of the research; and software to analyze or compare data sets.

4.4 Archive, document, and maintain in a user readable form of data sets used for research, development, and applications activities, whether these data originate from NASA instrument measurements, model calculations, or from external collaborators.

4.5 Provide investigator coordination, mission document preparation, database design and maintenance, and meeting support for investigators associated with field campaigns and satellite missions related to research efforts supported by this contract.

4.6 Draft reports on work performed, provide support in the preparation of presentations and drafting of articles for publication in refereed journals, provide support in the presentation of research results at scientific meetings, and in critiquing the research of others working in related fields.

4.7 Provide support for planning, organizing, providing scientific support for talks, meetings, and conferences, including: web sites, audio-visual and IT equipment, minutes and action item lists with distribution and tracking.

4.8 Provide support to aid in the preparation of GSFC reports.

4.9 Provide support for the preparation of research and development proposals submitted in response to Research Announcements of Opportunity, Broad Area Announcements,

and any other research proposal solicitation open to NASA civil servants.

5.0 **Education and Public Outreach Support**

5.1 Provide support for Education and Public Outreach (E/PO) activities related to the programs and research supported under this contract. Develop, enhance, and improve E/PO programs, materials, methods, and contacts.

5.2 Transcribe verbal or written information into a cogent form for the general public, educators, and special interest researchers.

5.3 Perform outreach to convey research information in a form that is understandable to the general public, educators, and scientists.

5.4 Develop, maintain, and enhance Section 508 complaint websites to communicate and inform the general public and the scientific community about the activities of the GSFC, its Branches, and the EOS program.

5.5 Support intern and mentoring programs to help GSFC grow the next generation of Earth Scientists.

5.6 Support collaboration between the GSFC scientists and the academic community. Formal collaboration exists under the following Memoranda of Understanding and Cooperative Agreements:

- CIMSS, with the University of Wisconsin, Madison;
- ESSIC, with the University of Maryland, College Park;
- CICS, with the University of Maryland, College Park;
- GEST, with the University of Maryland, Baltimore County (and involving Howard University);
- JCET, with the University of Maryland, Baltimore County;
- JCOSS, with the Scripps Institution of Oceanography, University of California, San Diego;
- Cooperative agreement with Colorado State University, Fort Collins, Colorado.
- NPP, with Oak Ridge Associated University

5.7 Support the NSF's GLOBE primary and secondary school science education program.

5.8 Support NASA's PUMAS web site for K-12 math and science teachers.

5.9 Support NASA's educational STEM programs at Goddard that are pertinent to the atmospheric sciences, such as SCRC, SIES and SESI.

5.10 Provide support for scientific collaboration with the Howard University Program in Atmospheric Sciences (HUPAS), particularly at the NOAA-Howard University Center for Atmospheric Sciences (NCAS) and the field observation research station at the Howard University Research site at Beltsville (HURB).

5.11 Provide support to maintain and expand working relationships between GSFC scientists with governmental (e.g., NOAA, the National Park Service, GSFC Fish and Wildlife Service, Department of Agriculture), and non-governmental organizations, for purposes of sharing content and enhancing applications. Collaborate with these groups on development E/PO materials and programs using GSFC data and/or science content.

5.12 Provide avenues, for users outside of GSFC and for scientific collaborators of GSFC members, to access programs and data located on GSFC workstations and data storage systems.

6.0 Mission Science Support

6.1 Provide support for project scientists and principal investigators formulate future satellite missions, particularly missions called for in "Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond" (aka the Decadal Survey), including and not limited to: the Aerosols, Clouds, and Ecology (ACE) mission; the Geostationary Coastal and Air Pollution Events (GEO-CAPE) mission; the Active Sensing of CO2 Emissions over Nights, Days, and Seasons (ASCENDS) mission, the Global Tropospheric 3-D Wind mission; the Global Atmospheric Composition Mission (GACM); and the Joint Polar Satellite System (JPSS).

6.2 Provide support for project scientists and principal investigators to oversee the implementation phases of satellite missions in development including and not limited to: the Global Precipitation Mission (GPM); the NPOESS Preparatory Project (NPP); and Glory.

6.3 Provide support for project scientists and principal investigators to manage or oversee operations of satellite missions in orbit including and not limited to: Terra; Aqua; Aura; Geostationary Operational Environmental Satellites (GOES); and the Solar Radiation and Climate Experiment (SORCE).

6.4 Provide support for project scientists and principal investigators to formulate, plan and implement sub-orbital missions for atmospheric process studies, and validation of satellite instrumentation.

6.5 Contribute to the specification of requirements for instruments, instrument performance, satellite performance, data quality, derived data products, and ground system performance.

6.6 Contribute to the definition of mission operation concepts.

6.7 Provide support to organize and manage science teams; plan and report on science team meetings; promote and support organize sessions at symposia and special issues of scientific journals to report science team research results.

6.8 Support the pre-launch calibration and performance characterization of sensors by understanding sensor test procedures, by observing and monitoring pre-launch tests, and by analyzing test data.

6.9 Support the post-launch calibration and performance monitoring of sensors in-orbit by analyzing and evaluating calibration data, participating in field calibration experiments, updating calibration coefficients, and validating calibrated data.

6.10 Provide support in defining and specifying data products and support the development and documentation of the algorithms necessary to generate those products from satellite sensor data.

6.11 Support the specification, design, development, and operation of satellite data handling and processing systems that fall under the responsibilities of GSFC project scientists and principal investigators.

7.0 System Administration, Computer Operations, and Mission Support

7.1.1 For equipment used to support field campaigns, provide all necessary system administration, maintenance, and IT security services for the networks, workstations, servers, desktop and laptop computers, and data storage systems belonging to the Laboratory and associated scientists. These services include, but are not limited to, routine maintenance, installation of software upgrades and security patches, fixing computer vulnerabilities and compromises, assisting in the development of an IT security plan, and documenting all procedures followed in providing support services.

7.1.2 Develop, maintain, and document software necessary to manage Laboratory data sets, such as the following: data sets generated by the various observations campaigns and laboratory experiments; results from the research models used in the Branches; and archived data sets used in support of the research. Provide communications software to move data sets between computers. Develop section 508 compliant websites for the easy dissemination of data sets between Branch researchers and their collaborators, or for use by the science community.

7.1.3 Develop, maintain, and document software necessary for the EOS Project Scientists to monitor the capabilities of the Earth Observing System Data and Information System (EOSDIS) to process and distribute data.

7.1.4 Develop, maintain and document new or enhanced software tools for the following purposes: to acquire and display stratospheric and upper tropospheric data sets derived from measurements taken from spacecraft, aircraft, balloons, and ground based platforms; and to analyze computer model generated output and atmospheric observations when investigating physical and chemical atmospheric processes.

7.1.5 Archive, document, and maintain in a user readable form of all data sets used for these research, development, and applications activities, whether these data originate from NASA instrument measurements, model calculations, or from external collaborators.

7.1.6 Provide avenues, for users outside of GSFC and for scientific collaborators of Branch members, to access programs and data located on GSFC workstations and data storage systems.

7.1.7 Provide programming, software upgrades, documentation, and design control of computer programs used to determine optimal aircraft flight paths for aircraft field campaigns associated with the research efforts supported by this contract.

7.1.8 Provide investigator coordination, mission document preparation, database design and maintenance, and meeting support for investigators associated with field campaigns and satellite missions related to research efforts supported by this contract.

7.1.9 Provide technical assistance to the EOS Project Scientists and investigators in determining requirements for ground support of flight operations, and in implementing that support.

7.1.10 Support the development of the Global Precipitation Measurement mission from mission formulation, through ground validation, and into data applications. Similarly support other planned or potential missions involving GSFC instruments, for example NPP, and GEO-CAPE.

8.0 Administrative Support

8.1. Develop, maintain, and track database systems for all phases of administration including, but not limited to, property and chemical inventories, travel budgets, proposal charges, purchase orders, credit card purchases, property passes, proposal submissions, and reimbursable expenditures.

8.2. Assist in the preparation of the fiscal year budgets for review, gather information from funding sources, alert principal investigators to status of contracts and proposals, draft purchase requests, prepare shipping documents and arrange for pick-ups.

8.3. Prepare charts and viewgraphs for administrative reviews, provide administrative reports in accordance with contract requirements, and assist in the preparation of the fiscal year Branch budgets and their submittal to the Laboratory.

8.4. Review with the Laboratory and ESPD leadership all administrative requirements for the fiscal year (including, but not limited to, personnel requirements, hardware and software purchases, and maintenance agreements).

8.5. Coordinate and provide logistics support for visitors from outside Goddard Space Flight Center.

8.6 Assist in planning, organizing, providing logistical support to talks, meetings, and conferences, including ESPD workshops and conferences. Provide logistical support, including: web sites, production of invitational orders for attendees, travel accommodations, meeting space set-up, break-out rooms, audio-visual and IT equipment, climate and lighting tools, copiers, faxes, phones, registration other on-site administrative assistance. Provide minutes and action item lists distribution and tracking. Make rapid travel and procurement related obligations to support workshop/project activities such as air transportation, hotel rooms, registration fees, supplies, and conference expenses. Arrange travel for non-NASA participants to include flight reservations, lodging, rental car, and other needs.

LIST OF ACRONYMS

AERONET	Aerosol Robotic Network
AIRS	Atmospheric Infrared Spectrometer
ARIES	Advanced Remote-sensing Imaging Emission Sounder
ARM	Atmospheric Radiation Measurement (DoE Program)
AMF	ARM Mobile Facility
BCCSO	Beltsville Center for Climate Change Observation
CICS	Cooperative Institute for Climate Studies
CIMMS	Cooperative Institute for Mesoscale Meteorological Studies
DAAC	Distributed Active Archive Center
DoD	Department of Defense
DoE	Department of Energy
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESD	Earth Sciences Division
ESSIC	Earth System Science Interdisciplinary Center
ESTO	Earth Science Technology Office
GCM	General Circulation Model
GCOS	Global Climate Observing System
GEO-CAPE	Geostationary Coastal and Air Pollution Events
GEOS	Goddard Earth Observing System
GEST	Goddard Earth Sciences and Technology (Center)
GLOBE	Global Learning and Observations to Benefit the Environment
GloPac	Global Hawk Pacific Experiment
GLOW	Goddard Lidar Observatory for Winds
GMAO	Global Modeling Assimilation Office (by GEOS)
GOES	Geostationary Operational Environmental Satellite
GPCP	Global Precipitation Climatology Project
GPM	Global Precipitation Measurement
GSSP	Graduate Student Summer Program (by GEST)
GTE	Global Tropospheric Experiment
GV	Ground Validation
GVP	Ground Validation Program
HIVIS	High Resolution Visible Sensor
HU	Howard University
HUPAS	Howard University Program in Atmospheric Sciences
HURB	Howard University Research site at Beltsville
IIP	Instrument Incubator Program
JCET	Joint Center for Engineering and Technology
JCOSS	Joint Center for Observation System Science
JPSS	Joint Polar Satellite System
LDCM	Landsat Data Continuity Mission
MODIS	Moderate Resolution Imaging Spectroradiometer
MPL	Micro Pulse Lidar
MPLNET	Micro Pulse Lidar Network

NAS	NASA Advanced Supercomputing
NCAR	National Center for Atmospheric Research (by NSF)
NCAS	NOAA (Howard University) Center for Atmospheric Sciences
NCCS	NASA Center for Climate Simulation
NCEP/NCAR	National Center for Environmental Prediction/National Center for Atmospheric Research
NCEP/CPC	National Center for Environmental Prediction/Climate Prediction Center
NCEP/MRF	National Center for Environmental Prediction/Medium Range Forecast
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar Orbiting Environmental Satellite System
NPP	NPOESS Preparatory Project
NPP	NASA Postdoctoral Program
NSF	National Science Foundation
ORAU	Oak Ridge Associated University
ORNL	Oak Ridge National Laboratory
OSSE	Observing System Simulation Experiment
POAM	Polar Ozone and Aerosol Measurement
POES	Polar Orbiting Environmental Satellite
PUMAS	Practical uses of Math and Science
RCDF	Radiometric Calibration and Development Facility
RTOP	Research and Technical Operations Plan
SAGE	Stratospheric Aerosol and Gas Experiment
SCRC	Student Climate Research Campaign
SESI	Scientific and Engineering Student Internship
SHADOZ	Southern Hemisphere Additional Ozonosondes
SIES	Summer Institute in Earth Sciences
SOLVE	SAGE III Ozone Loss and Validation Experiment
STEM	Science, Technology, Engineering, and Mathematics
TIMED	Thermosphere Ionosphere Mesosphere Energy and Dynamics
TOMS	Total Ozone Mapping Spectrometer
TRMM	Tropical Rainfall Measuring Mission
UARP	Upper Atmosphere Research Program
UARS	Upper Atmosphere Research Satellite
UAV	Unmanned Aerial Vehicle
UMBC	University of Maryland, Baltimore County
UMCP	University of Maryland, College Park
GSFCGS	U.S. Geological Survey
WCRP	World Climate Research Program
WMO	World Meteorological Organization